WE CLAIM:

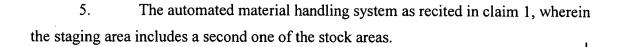1. An automated material handling system, comprising:

a plurality of material carriers including a plurality of empty carriers classified into two or more carrier types;

one or more stock areas each including a plurality of bins for storing material carriers, wherein each stock area is associated with one or more thresholds for each carrier type;

a control system coupled to a first one of the stock areas for computing an empty percentage for the first stock area for each carrier type, the empty percentage for a particular carrier type being the percentage of bins of the first one stock area which contain empty carriers of the particular type; and
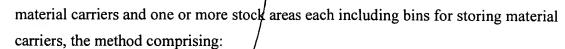
a transportation system responsive to the control system for selectively moving an empty carrier of a certain carrier type between a staging area and the first stock area based on a comparison of the empty percentage for the certain carrier type to the one or more thresholds of the first stock area for the certain carrier type.

2. The automated material handling system as recited in claim 1, wherein the material carriers include semiconductor wafer carriers.

3. The automated material handling system as recited in claim 1, wherein the one or more thresholds for the empty carrier of the certain carrier type include a maximum value and wherein the transportation system moves an empty carrier of the certain carrier type from the first stock area to the staging area if the maximum value is exceeded by the empty percentage of the certain carrier type.

4. The automated material handling system as recited in claim 1, wherein the one or more thresholds for the empty carrier of the certain carrier type include a minimum value and wherein the transportation system moves an empty carrier of the certain carrier type to the first stock area from the staging area if the empty percentage of the certain carrier type falls below the minimum value.

21

5.   The automated material handling system as recited in claim 1, wherein the staging area includes a second one of the stock areas.

6.   The automated material handling system as recited in claim 1, wherein the control system calculates a system move rate as the number of the plurality of material carriers moved by said transportation system in a predetermined time period and the transportation system moves the empty carrier of the certain carrier type between the staging area and the first stock area only if the system move rate is less than a predetermined value.

7.   The automated material handling system as recited in claim 1, wherein each empty carrier type is associated with a priority and wherein the transportation system moves the empty carrier of the certain carrier type between the first stock areas and the staging area based on the priority of the certain carrier type and the priorities of other carrier types.

8.   The automated material handling system as recited in claim 1, wherein the control system calculates an empty move rate for the certain carrier type as the number of empty carriers of the certain carrier type moved by the transportation system in a predetermined time period and the transportation system moves the empty carrier of the certain carrier type between the staging area and the first stock area only if the empty move rate for the certain carrier type is less than a predetermined value.

9.   The automated material handling system as recited in claim 1, wherein the control system calculates a global empty move rate as the number of all empty carriers moved by the transportation system in a predetermined time period, and the transportation system moves the empty carrier of the certain carrier type between the staging area and the first stock area only if the global empty move rate is less than a predetermined value.

10.   A method for managing empty material carriers in an automated material handling system including a plurality of material carriers including empty

22

material carriers and one or more stock areas each including bins for storing material carriers, the method comprising:

classifying at least the empty material carriers into two or more carrier types;

associating each of the stock areas with one or more thresholds for each carrier type;
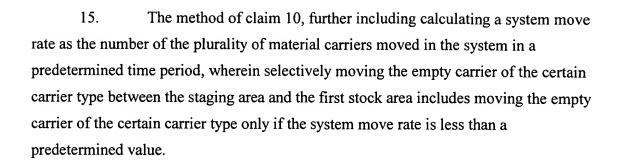
computing an empty percentage for each empty carrier type for a first one of the stock areas, the empty percentage for a particular empty carrier type being the percentage of bins of the first one stock area which contain empty carriers of the particular type; and

selectively moving an empty carrier of a certain carrier type between a staging area and the first stock area based on a comparison of the empty percentage for the certain carrier type for the first stock area to the one or more thresholds of the first stock area for the certain carrier type.

11. The method of claim 10, wherein the material carriers include semiconductor wafer carriers.

12. The method of claim 10, wherein the one or more thresholds for the empty carrier of the certain carrier type include a maximum value and wherein selectively moving the empty carrier of the certain carrier type from the first stock area to the staging area includes moving the empty carrier of the certain carrier type if the maximum value is exceeded by the empty percentage of the certain carrier type.

13. The method of claim 10, wherein the one or more thresholds for the empty carrier of the certain carrier type include a minimum value and wherein selectively moving the empty carrier of the certain carrier type to the first stock area from the staging area includes moving the empty carrier of the certain carrier type if the empty percentage of the certain carrier type falls below the minimum value.

14. The method of claim 10, wherein the staging area includes a second one of the stock areas.

23

15.   The method of claim 10, further including calculating a system move rate as the number of the plurality of material carriers moved in the system in a predetermined time period, wherein selectively moving the empty carrier of the certain carrier type between the staging area and the first stock area includes moving the empty carrier of the certain carrier type only if the system move rate is less than a predetermined value.

16.   The method of claim 10, further including associating each empty carrier type with a priority, wherein selectively moving the empty carrier of the certain carrier type between the first stock areas and the staging area includes moving the empty carrier of the certain carrier type based on the priority of the certain carrier type and the priorities of other carrier types.

17.   The method of claim 10, further including calculating an empty move rate for the certain carrier type as the number of empty carriers of the certain carrier type moved in the system in a predetermined time period, wherein selectively moving the empty carrier of the certain carrier type between the staging area and the first stock area including moving the empty carrier of the certain carrier type only if the empty move rate for the certain carrier type is less than a predetermined value.

18.   The method of claim 10, further including calculating a global empty move rate as the number of all empty carriers moved in the system in a predetermined time period, wherein selectively moving the empty carrier of the certain carrier type between the staging area and the first stock area includes moving the empty carrier of the certain carrier type only if the global empty move rate is less than a predetermined value.

Add a 5